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(54) Title: POLYMER-SUPPORTED METAL NANOPARTICLES AND METHOD FOR THEIR MANUFACTURE AND USE

(57) Abstract: A method for making polymer-supported metal nanoparticles is disclosed comprising providing a polymer support material, contacting the polymer support with an appropriate metal nanoparticle or metal nanoparticle precursor, and contacting the polymer support material and metal or metal precursor with a fluid that swells the polymer support material sufficiently to allow the metal or metal precursor to diffuse into the polymer support material. If a metal nanoparticle precursor comprising a metal in an oxidized state is used, then the method also may comprise reducing the metal of the metal precursor to provide a metal nanoparticle. Typically, but not necessarily, the polymer support material is a plastic. The metal or the metal of the metal nanoparticle precursor can be any of various metals, including the noble metals, with particular examples including palladium, rhodium, platinum, iridium, osmium, gold, nickel, iron or combinations thereof. The nanoparticles can comprise alloys or aggregates of two or more metals. The fluid can be any fluid that facilitates polymer swelling, such as supercritical fluids, one example being supercritical carbon dioxide. A method for performing chemical reactions also is described comprising providing a polymer-supported metal nanoparticle and selected reagents under conditions allowing chemical reactions to occur. For example, the method may involve reducing or oxidizing sites of unsaturation or functional groups capable of being reduced or oxidized. Where plural reduction products are produced, relative amounts of the reduction products can be varied by selecting an appropriate metal nanoparticle, polymer support material, or both.

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